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Transportation Analysis Informing Transportation Planning and Policy at ODOT

Alexander Bettinardi
Oregon Department of Transportation

Transportation Analysis Informing Transportation Planning and Policy at ODOT

Friday Transportation Seminar

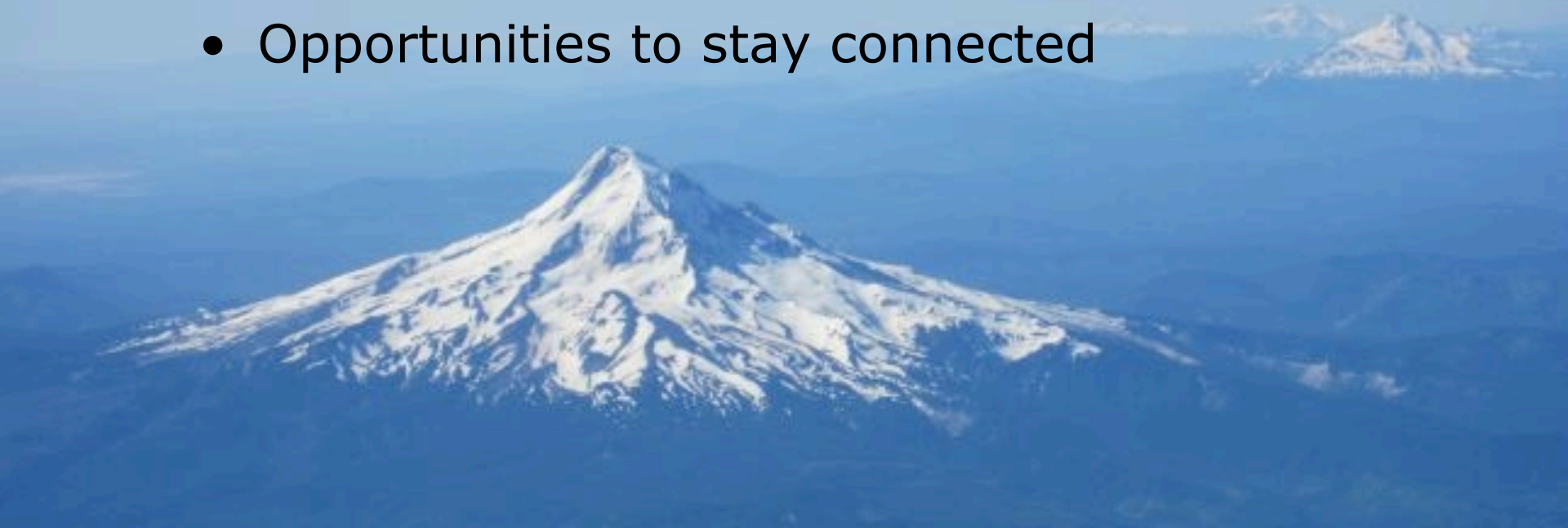
October 11, 2013

Alex Bettinardi, P.E.

Transportation Planning Analysis Unit (TPAU)

Presentation Overview

- Overview of ODOT
- Overview of TPAU
- Overview of the Analysis Tools used by ODOT
  - Examples of how they are used
  - New challenges, new tools
- Opportunities to stay connected



ODOT's 100th Birthday

$3 Vehicle registration fee

County Road Districts

State Highway Department

1859 1905 1913

ODOT Manages a Multi-Trillion Dollar Multi-modal Investment for the People of Oregon

ODOT Overview – Mission and Values

Mission:

- To provide a safe, efficient transportation system that supports economic opportunity and livable communities for Oregonians.

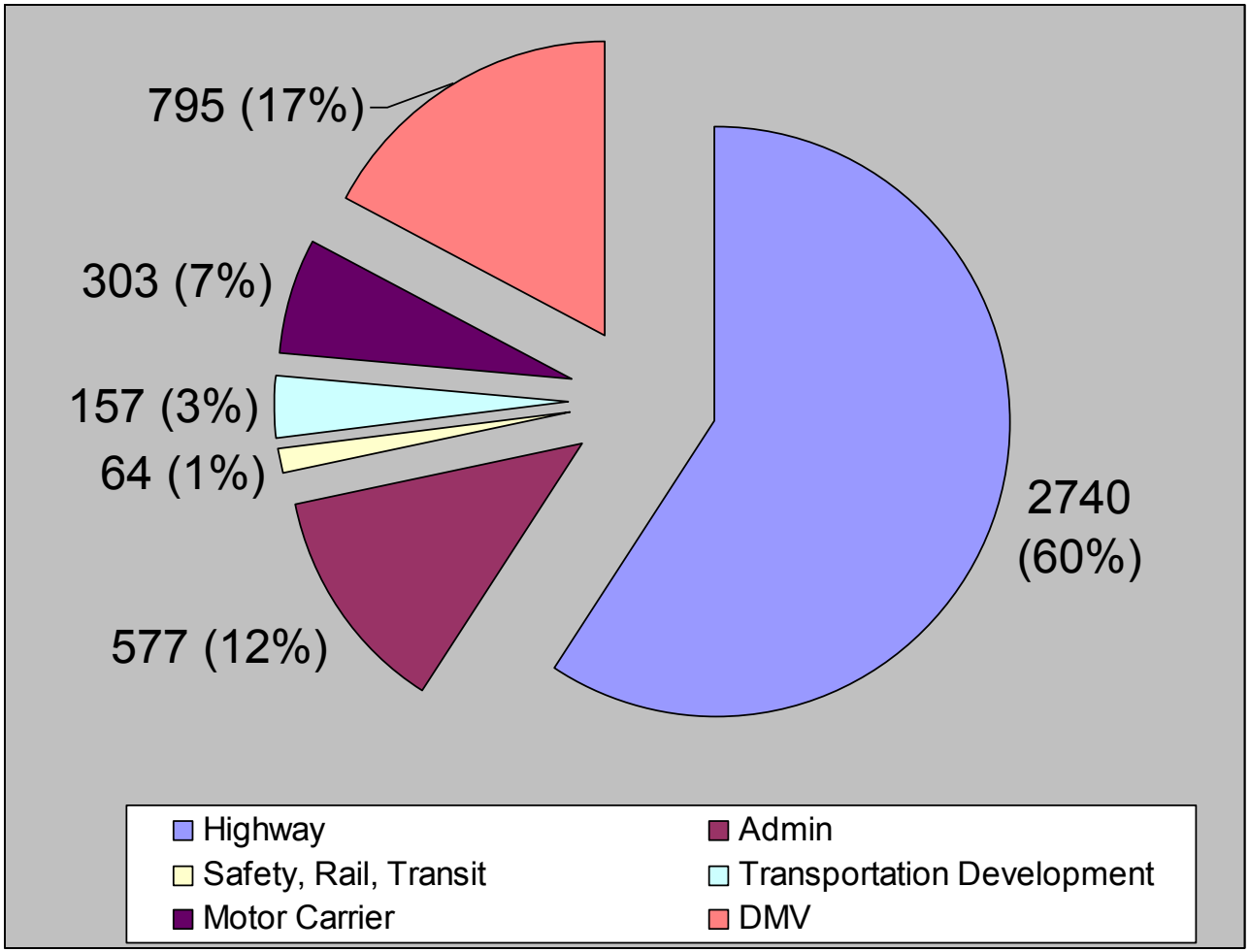
Values:

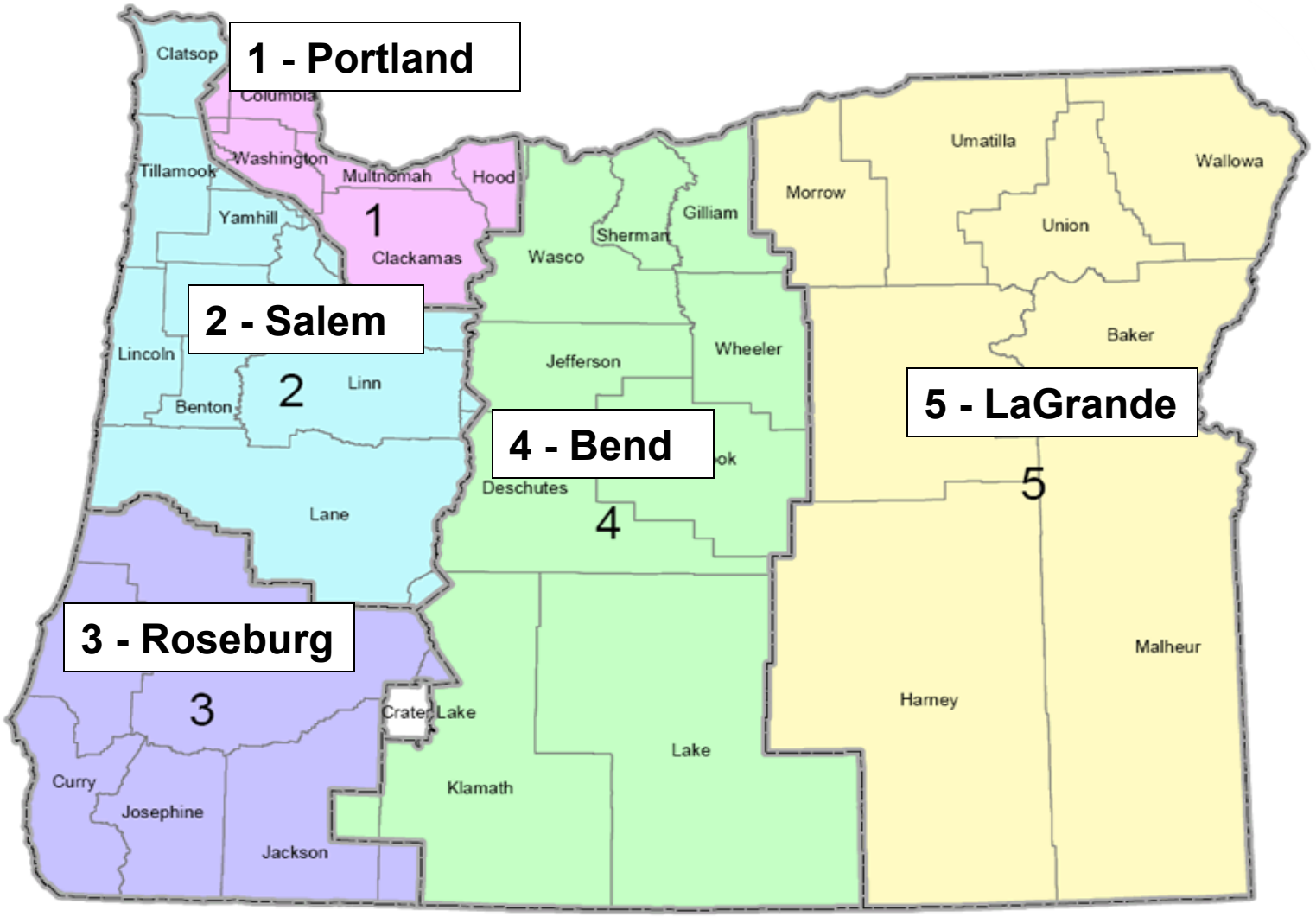
- Safety
- Customer Focus
- Efficiency
- Accountability
- Problem Solving
- Diversity
- Sustainability

ODOT Today ~4500 Employees
10 Divisions

- Central Services
- Driver and Motor Vehicles
- Communications
- Office of the Director
- Motor Carrier Transportation
- Public Transit
- Rail
- Transportation Safety
- Transportation Development
- Highway

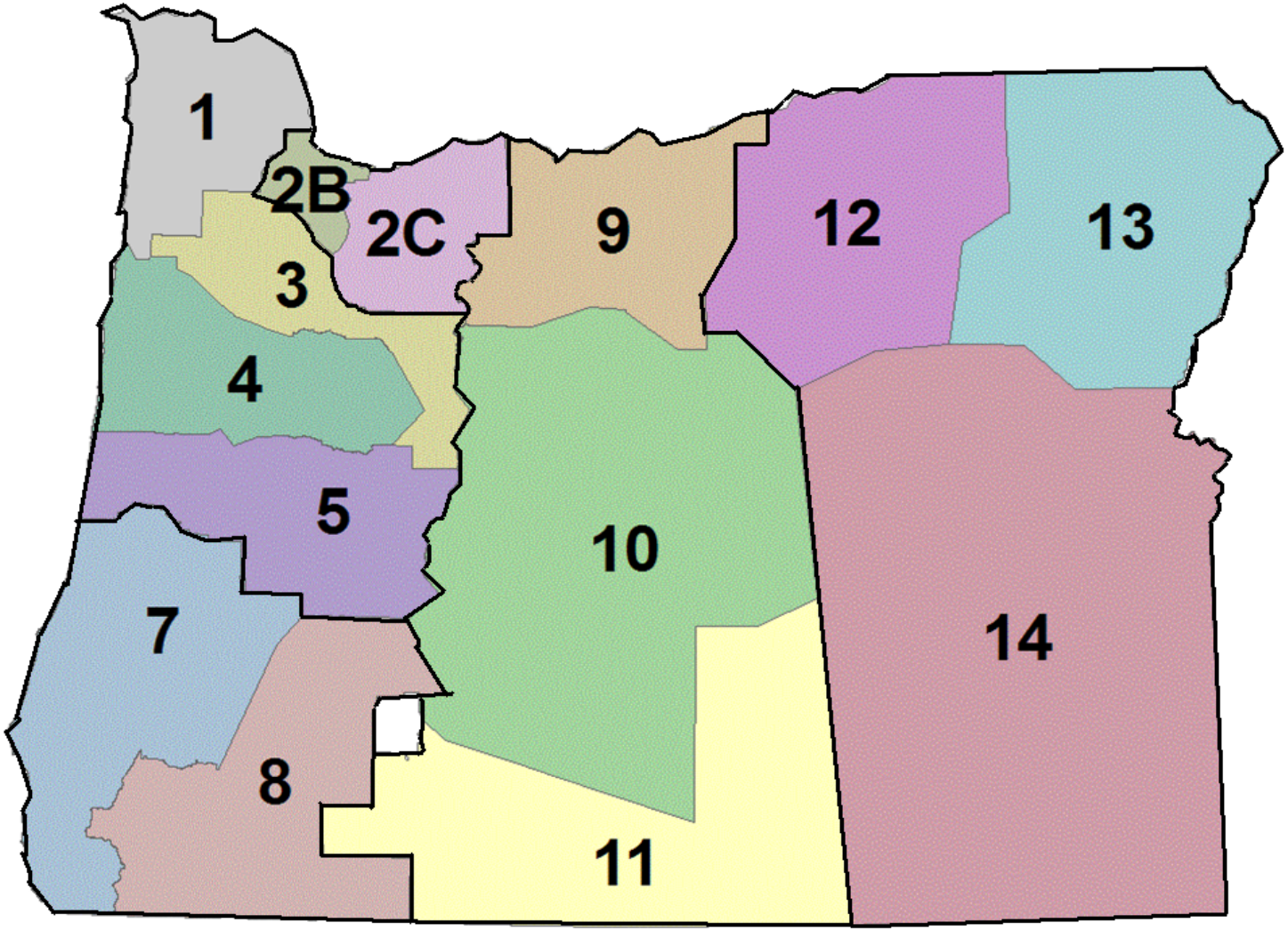
Employees by Division





Regional Map Of Oregon

District Map of Oregon



Funding

- Federal Funds: fuel tax, grants,
- State Funds: fuel tax, weight-mile tax, fees
  - 40% distributed to cities and counties
- Other: lottery, cigarette tax, license plates, permits, other fees

2011 - 13 Revenues (in millions)	
Beginning Balance	$576
Motor Fuels Tax	$1,106
Federal Funds	$998
Weight Mile Tax	$611
Driver and Vehicle Licenses	$676
Transportation Licenses and Fees	$97
Other Transfers to ODOT	$121
General Fund	$17
Lottery Proceeds	$70
Bond/COP Sales	$640
Sales and Charges for Service	$25
All Other Revenue	$49
Total Revenue	$4,986

What we do…

- Maintain, Preserve, and Construct:
  - 19,000 lane miles,
  - 2700 Bridges,
  - 2600 rail miles,

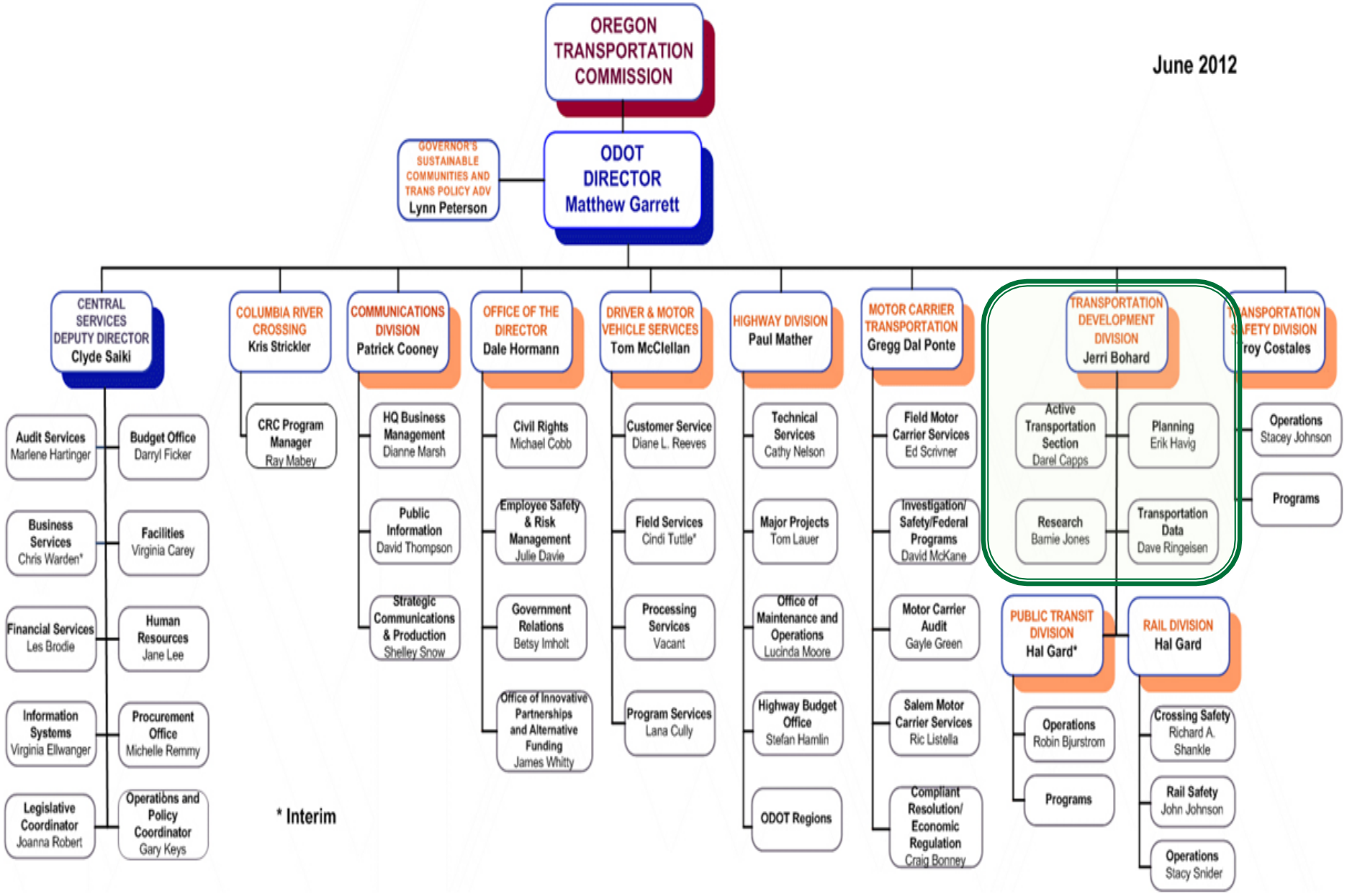
- DMV:
  - 3 million drivers licenses
  - 2 million vehicle license renewals a year
  - 1.7 million customer services calls annually
  - 12,000 transactions daily

That was a quick overview of ODOT

Next I'll describe where TPAU fits in

Oregon Department of Transportation

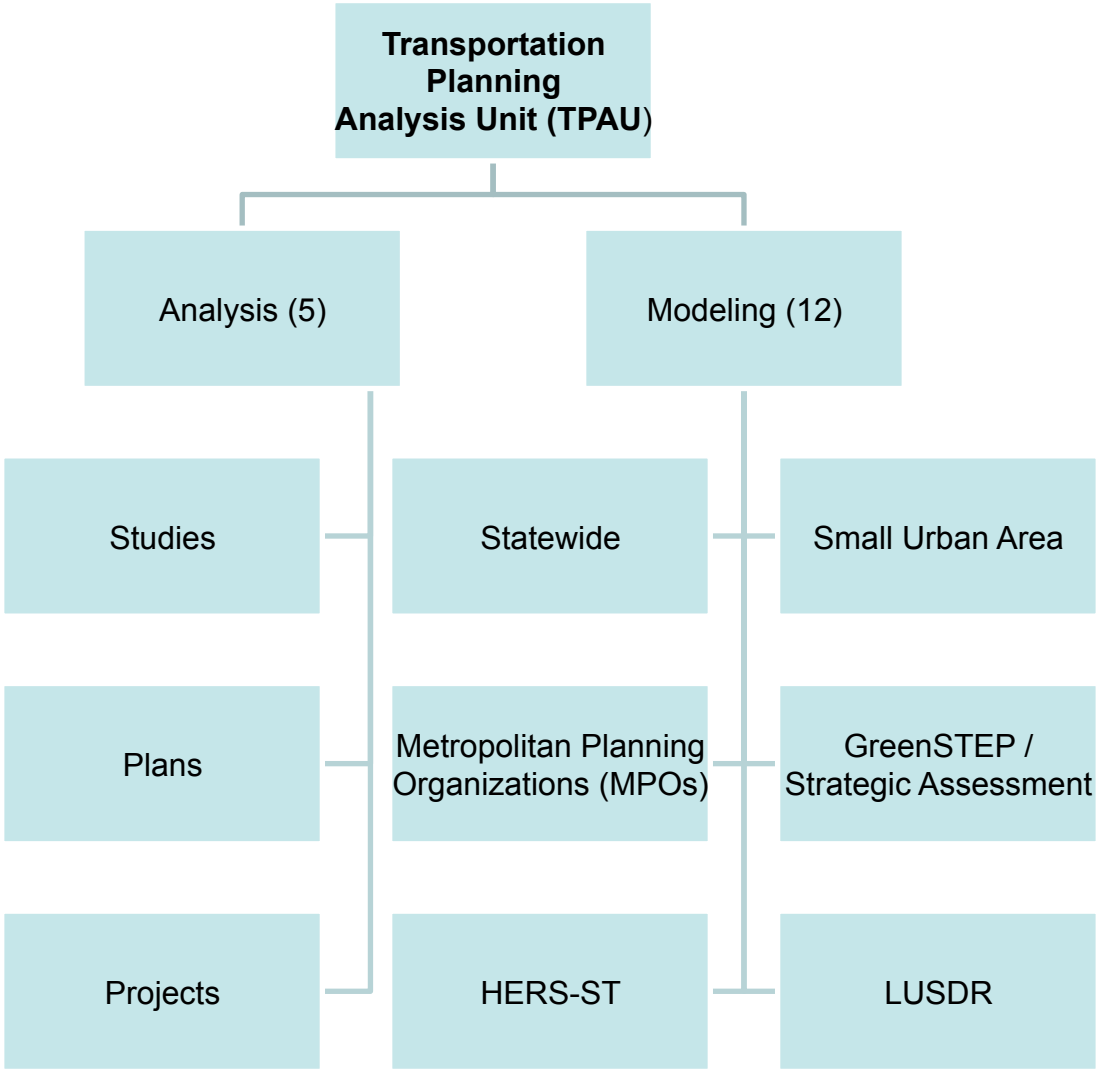
June 2012



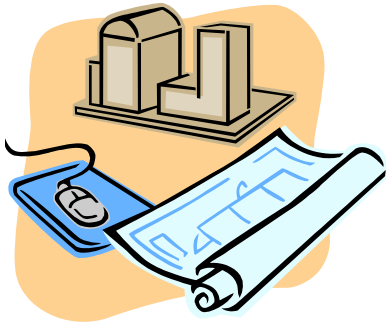
Development – Planning - TPAU

- Transportation Development
  - Planning (48)
  - Multimodal (26)
  - Transportation Data (58)
  - Research (14)

- Planning Section
  - Transportation Planning Analysis Unit (17)
  - Planning Unit (10)
  - Long Range Planning (15)
  - Freight (3) & Admin (4)


Transportation Planning Analysis Unit (TPAU)
Analysis (5)
Modeling (12)
Studies
Statewide
Small Urban Area
Plans
Metropolitan Planning Organizations (MPOs)
GreenSTEP / Strategic Assessment
Projects
HERS-ST
LUSDR

- Modeling Team
  - Creates model framework and tools
  - Develops urban, regional and statewide models
  - Applies models to support ODOT policy analysis and project development
  - Applies models to support urban area transportation and land use planning
  - Provides statewide guidance on modeling methods



- Analysis Team
  - Complex planning studies and projects involving major traffic flow changes
  - Review of analysis work by consultants
  - A reference and resource for Region Staff and consultants


LongRange Planning
Strategic Models
Trends
Travel Demand
Economic Activity
Traffic Counts
Driver Traits
Investment Alternatives
Landuse Forecast
Economic Forecast
Demographics
Forecasts
Urban Models
Travel Behavior
Economic Forces
Land Use
Vehicle Configuration
LEHD
Population Growth
VMT Patterns
Funding Delay
Statewide
Focus Models
Information
Travel Patterns
Historical Trends
Population Synthesizer
BenefitCost Analysis
Reliability
HPMS
Employment
Level of~Service
Targets
VMT
Regional Models
Freight Flows
Census
Traffic Simulation
Models
Traffic Patterns
Analysis Tools
System Performance
Vehicle Ownership
General Patterns
Performance Measures
Expected Growth
Policy Analysis

Lots of Information for Lots of Different Questions

TPAU transforms *data* into *information* used to make informed Agency decisions. High quality methods and tools are used to conduct transportation-related analysis.

Data

Observed patterns are recorded and stored for transportation activity, including vehicle counts, system characteristics: posted speed, curvature, lane miles, signals, width; household travel patterns, travel modes, population demographics, and employment. Data are cleaned for errors, missing elements, and checked for logic and consistency.

Information

Information is generated through assembly and ordering of facts (data) designed to reveal patterns, derive meaning and value. Information is used to formulate interpretations, identify relevance and derive new knowledge.

Knowledge

Agency experience and training are applied to make sense of the information. Agency decision makers interact with staff to reflect on information and transform it into knowledge, strategies and actions.

Transportation Planning Analysis Unit (TPAU)

Transportation Development Division, ODOT

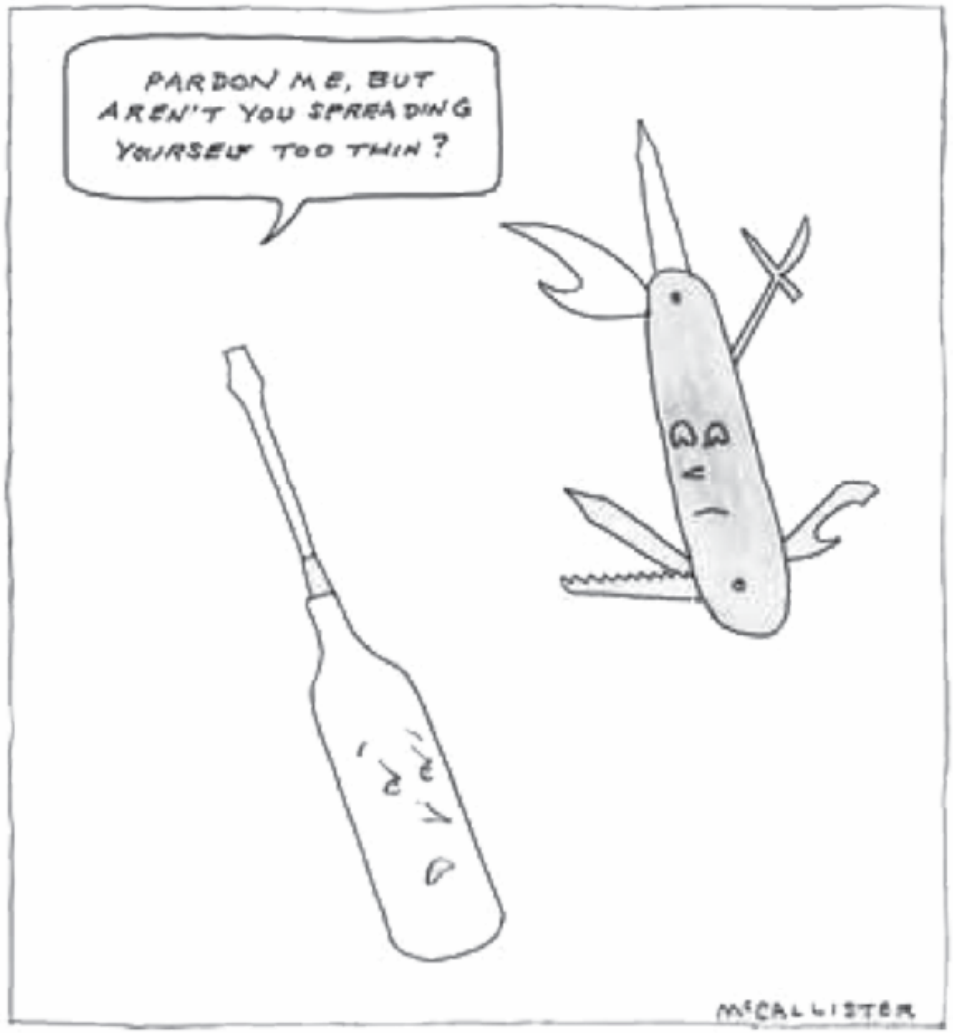
That was an Overview TPAU

Next I'll describe the tools and models that we house and utilize at TPAU.

Tool Dimensions need to match Q's

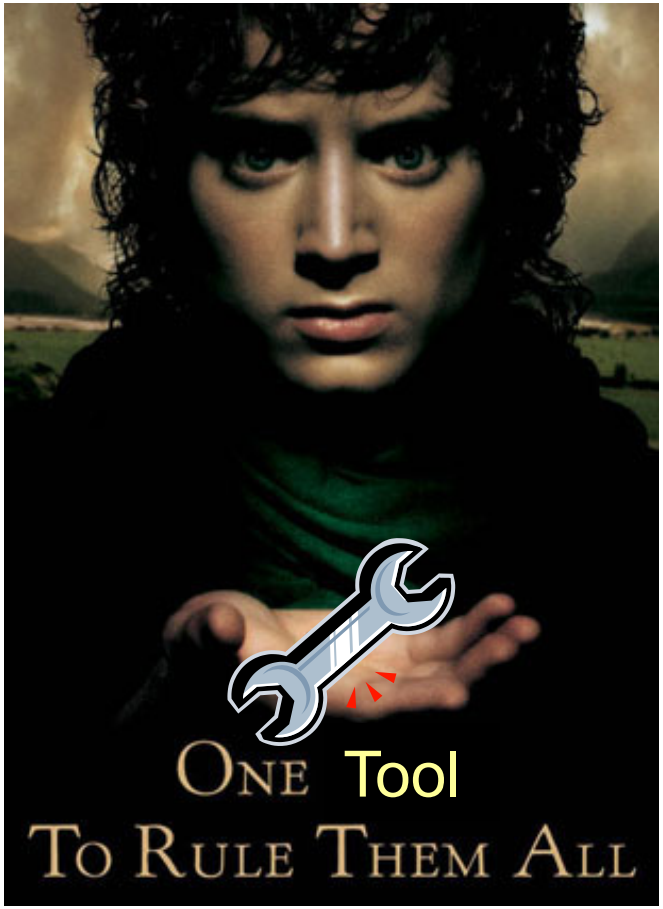
Geographic Scale	Level of Precision	Range of Questions
Statewide	Relative Trends	Policy and Planning
Regional	Corridors	STIP Selection
Urban Area (Macro)	Link Volumes	Urban Planning
Meso Analysis	Intersection Movements	Project Planning
Micro Analysis	Queue Lengths	Project Design

Right Tool for the Right Job

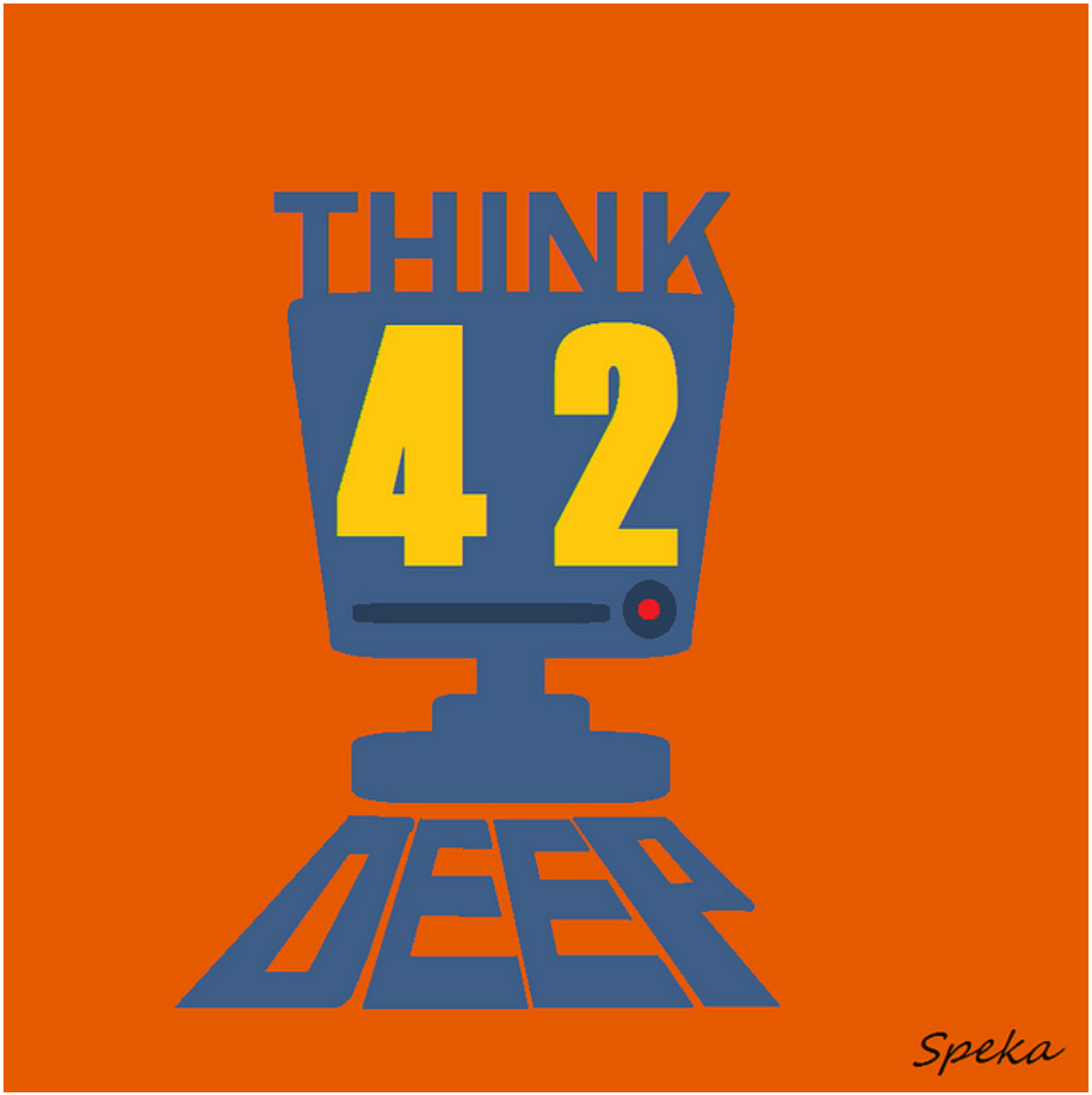


A Toolbox is What We Use

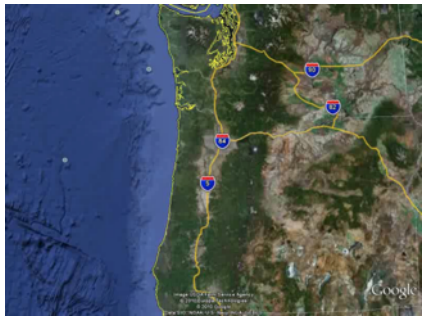
Myth



Myth


THINK
42
DEER
Speka

Oregon Department of Transportation: *A Century of Service*



Statewide Integrated Model

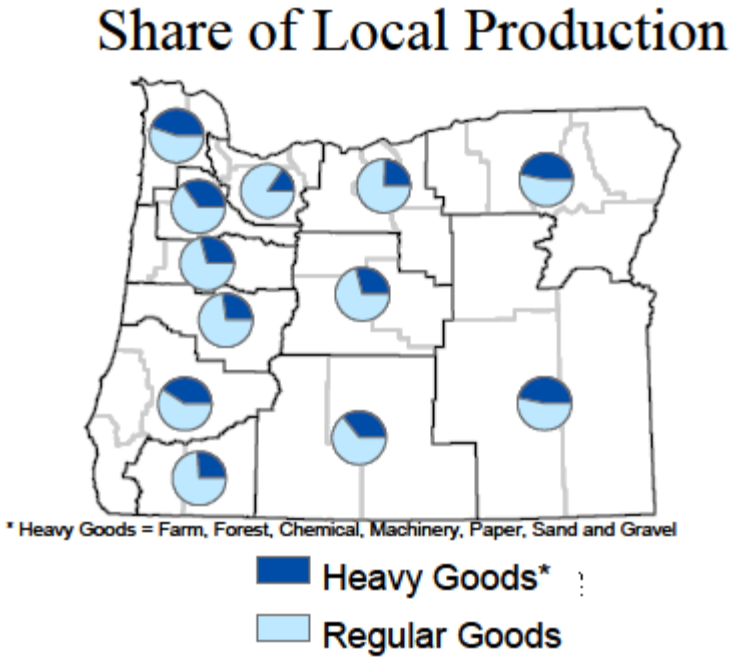
Features: Statewide/Region;

Economy-land-use-transportation,

land use is not pre-determined, has market signals

Examples:

- **Oregon Bridge Options Study**
- **I-5 Cottage Grove work zone**



Highway Economic Requirements System (HERS-ST)

Features: Statewide/Region (programs/policies)
Investment optimization tool
User costs; Roadway conditions/performance

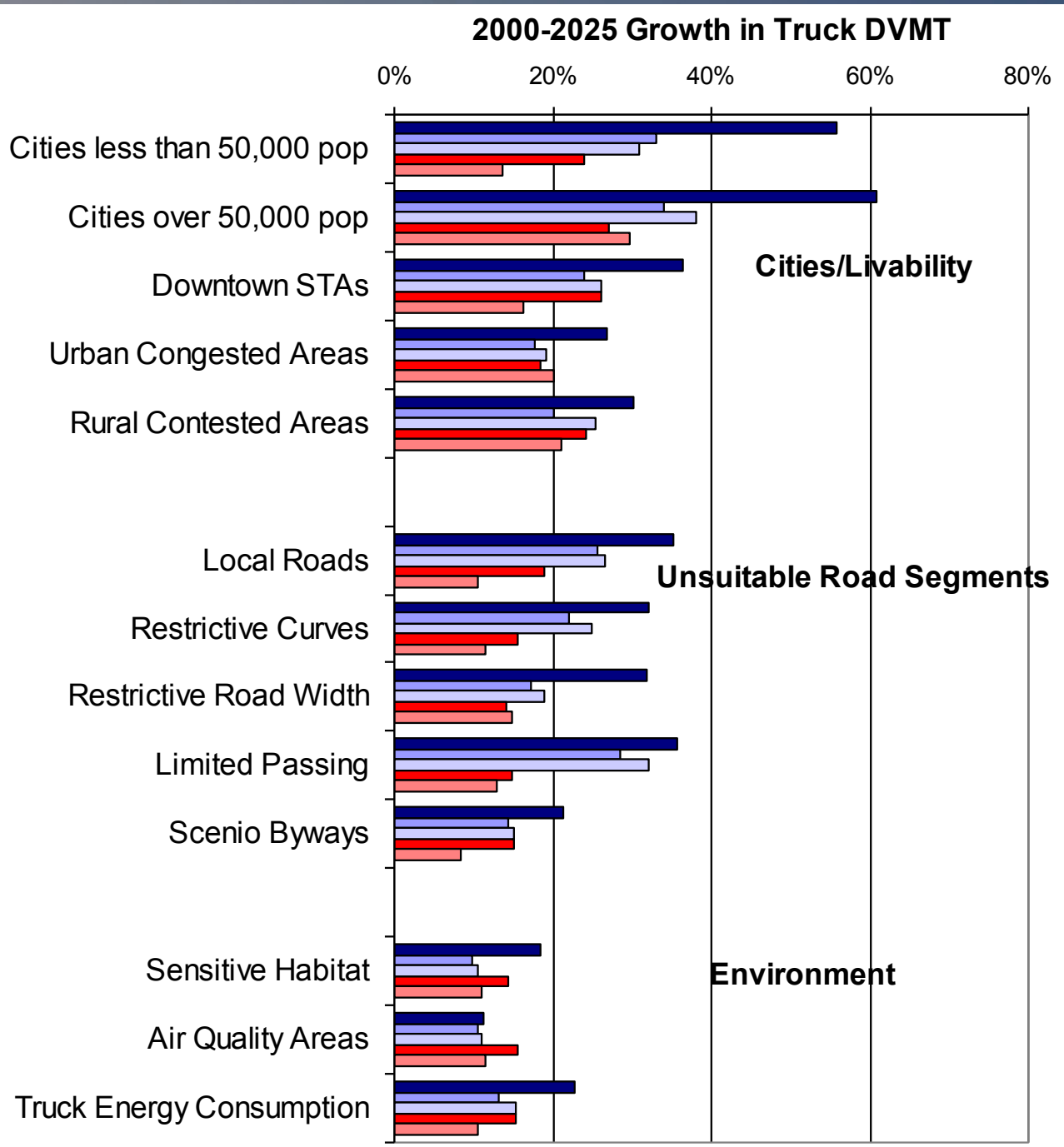
Examples:

- **Freight Metrics used in STIP selection process**

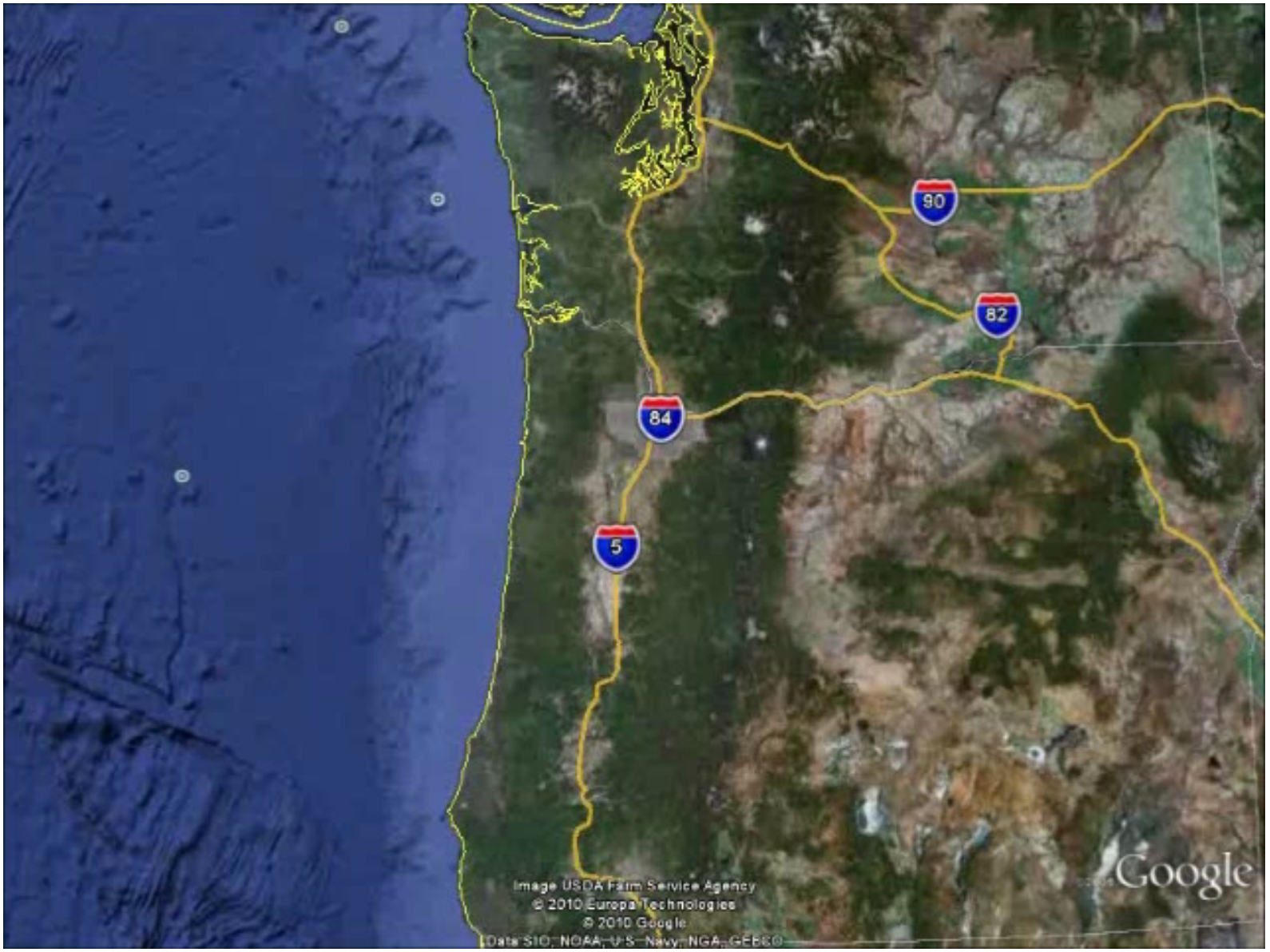
- **Oregon Bridge Options Study – detour impacts (linked to Statewide Model)**

ODOT Bridge Options Study

Local Impacts of Bridge Detours



Oregon Department of Transportation: *A Century of Service*



Urban Travel Demand Models

Features: Region/Urban level;

Average Weekday travel on roadways

…plus transit, walking, land use

Examples:

- **Air Quality** conformity, **RTPs**, **TSPs**
- Impact of new alignments / infrastructure

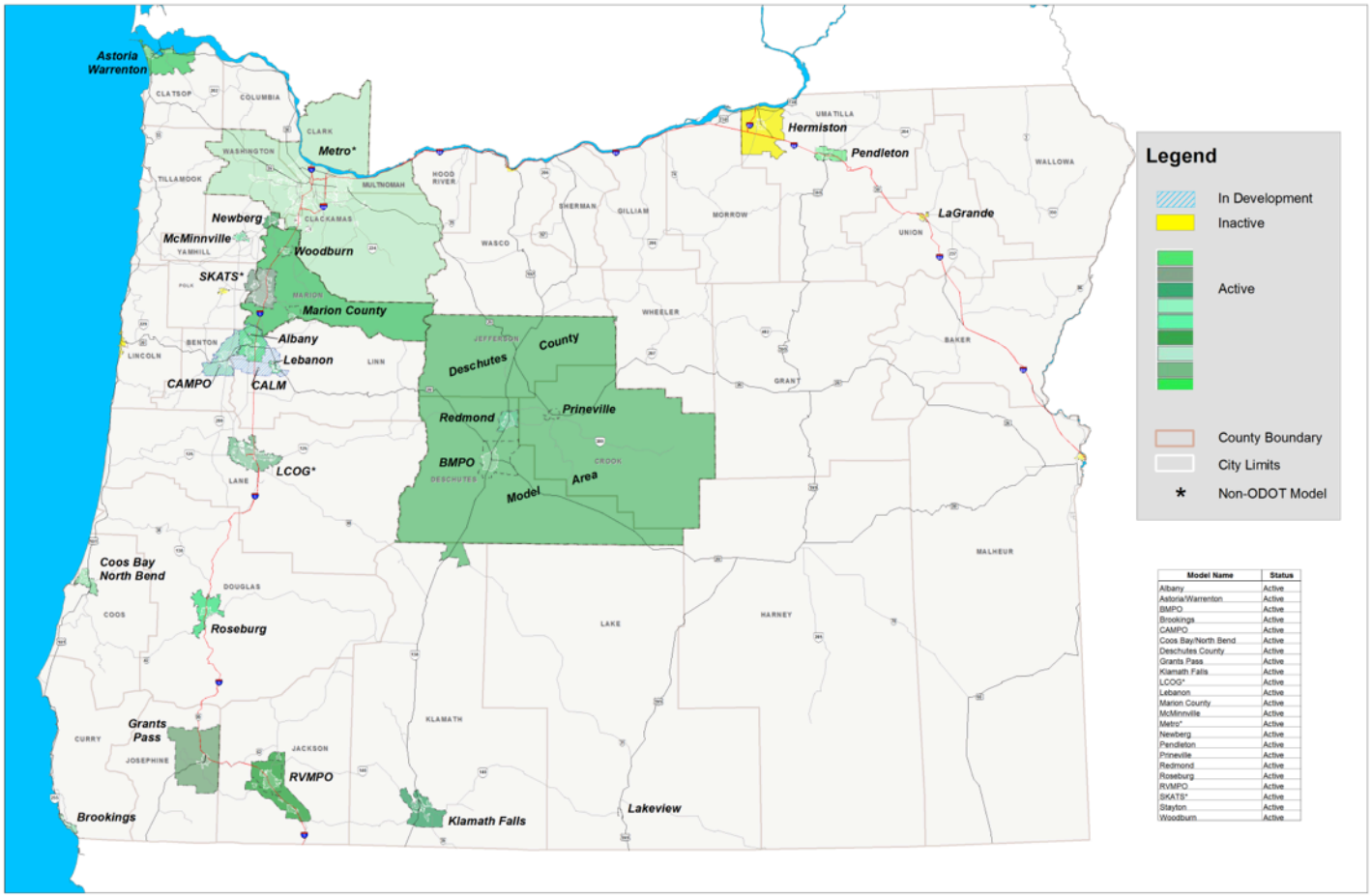
- Evaluate **Transit** & supportive land use
- Evaluate travel impact of **alternative land use patterns**

Oregon's Travel Demand Models

3 MPOs have modeling staff.

TPAU covers **5** MPOs (including the **2** new ones).

TPAU covers **12+** non-MPO models



OREGON DEPARTMENT OF TRANSPORTATION
Transportation Planning & Analysis Unit

TRAVEL DEMAND MODELS

Status as of March 2013

0 10 20 40
Miles

N

DISCLAIMER:
This product is for informational purposes only and may not have been prepared for or be suitable for legal, engineering or surveying purposes. Users of this information should review or consult the primary data and information sources to ascertain the usability of the information.

ModelingData\GIS\TravelDemandModelMap\TravelDemandModelMap_v2.3

March 2013


Wallace Rd NW
221
22
5
Salem Pkwy
Portland Rd NE
Silverton Rd
Lancaster Dr NE
Commercial St NE
555 13th St NE, Salem, OR 97301
Mission St SE
99E
N Santiam Hwy
Image U.S. Geological Survey
Image State of Oregon
Google

Project Analysis & Traffic Simulation

Features: Project/Corridor/Intersection level; Analysis & Design - Highway Capacity Manual to traffic simulation

Examples:

- How many **turn lanes** are needed at LOS C?
- What is the best **signal timing** in the corridor, what are the resulting **queue lengths**?
- How will pedestrian **safety** be impacted with **intersection geometry** changes?

The future is Uncertain

- Change is a **known unknown**
  - Demographic, Economic, Social, technology
- The specific form of change unclear
  - We have **methods** to account for unknowns in transportation and land use planning
  - **Continually updating** toolkit, methods, data
- Model many scenarios to understand range of alternate futures & assess risk

Demographics and Societal

Baby Boomers: The Aging Generation

- Older drivers cover fewer miles of travel
- One of the largest population groups is entering a lower VMT stage of life

Millennials: The Young Generation

- Younger drivers entering the driving population
- Equal in size to the baby boomers with too-soon-to-be-determined driving patterns
- Current patterns reveal they drive less, but reasons for this unclear - Economic conditions? Shift in preferences? Licensing laws?

Demographics and societal

- Increased trend towards urbanization
- Changing income distribution
- Vehicle starting to be viewed as a service
- Increased health concerns
- Increased environmental awareness

Technology

- Increased safety from advanced vehicle and infrastructure communication

Technology

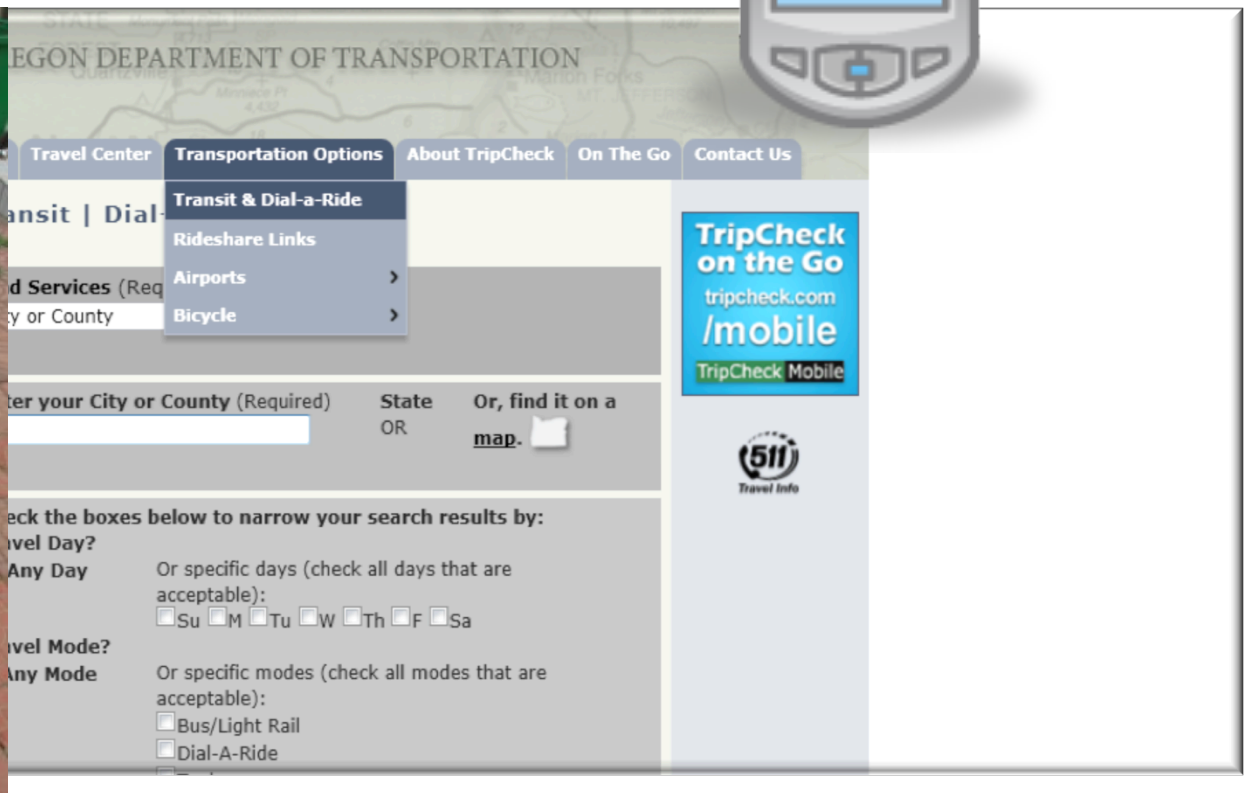
- Increased capacity and potentially different ways that we think about the urban forum

Technology

- New energy sources and associated infrastructure

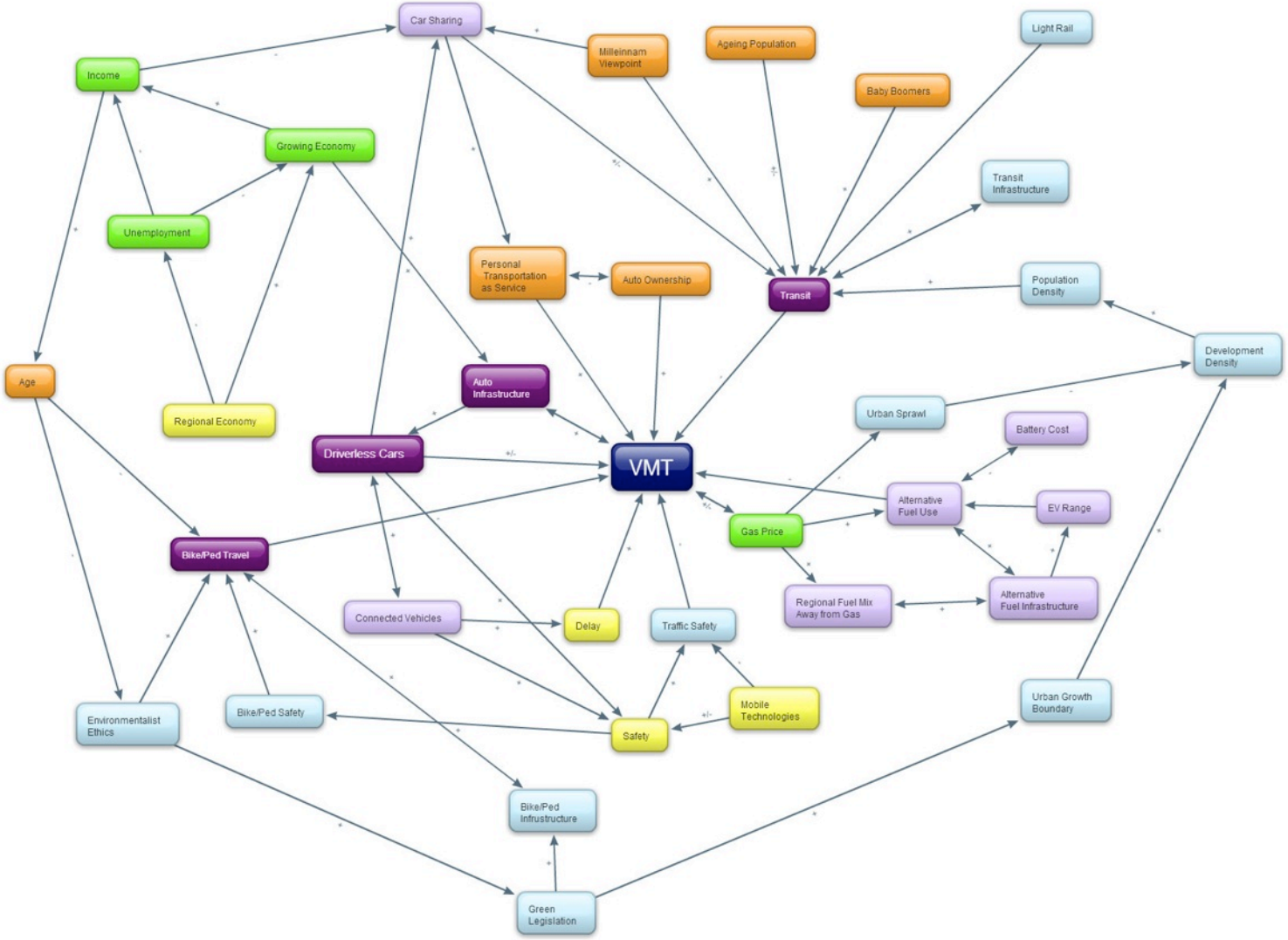
Technology

- Greater potential mode use



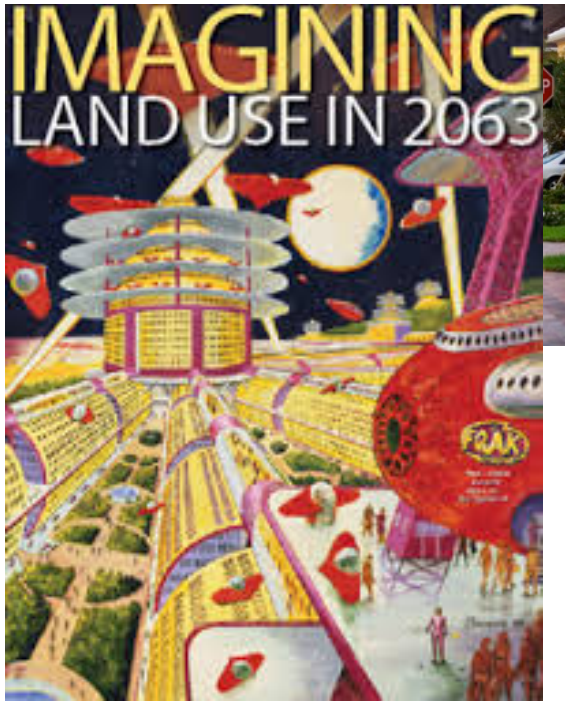
Age Patterns	The Millennial Generations (Born after 1981 to 2000)
	Baby Boomers (Born between 1946 and 1964)
	Aging Population/Effects
	Young Drivers and Licensing
Developing Technologies	Autonomous Vehicle (or self-driving cars)
	Light Rail and Electronic Vehicles
	Mobile Technology (i.e., online shopping)
	Car-sharing Technology
	Connected Vehicle Technology
Social Aspects	Fading car culture
	Demographics
	Urbanization
	Vehicles Miles Travelled
Economic Aspects	Gasoline Price/Fuel Costs
	Consumer Preferences
	Income and Geographic Location

Cognitive Map Creation



Sometimes Existing Tools Do Not Suit Analytical Needs

Land Use Scenario Developer in R (LUSDR)



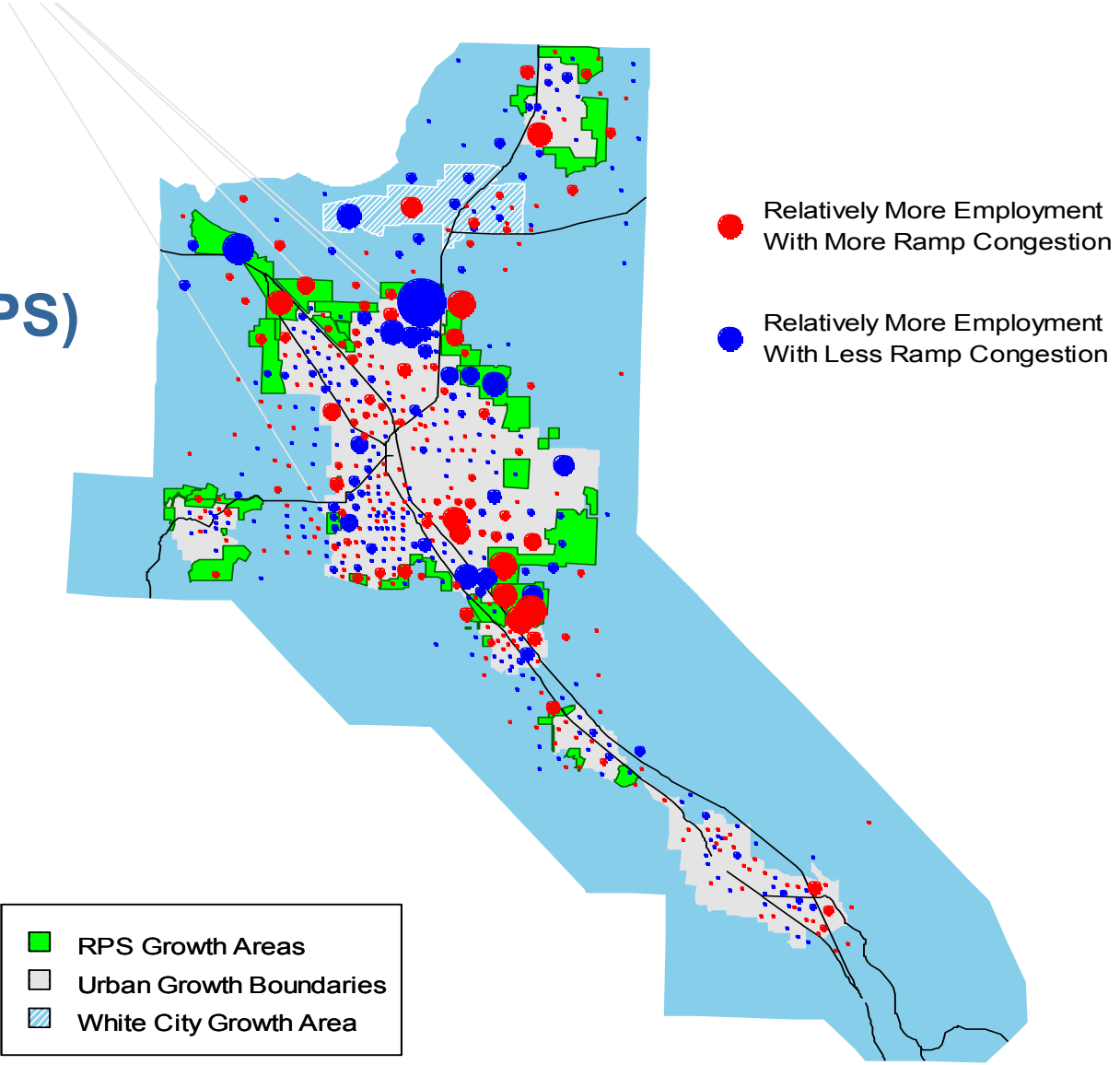
Features: Region/Urban level;
Build/assess many land use futures

Example:

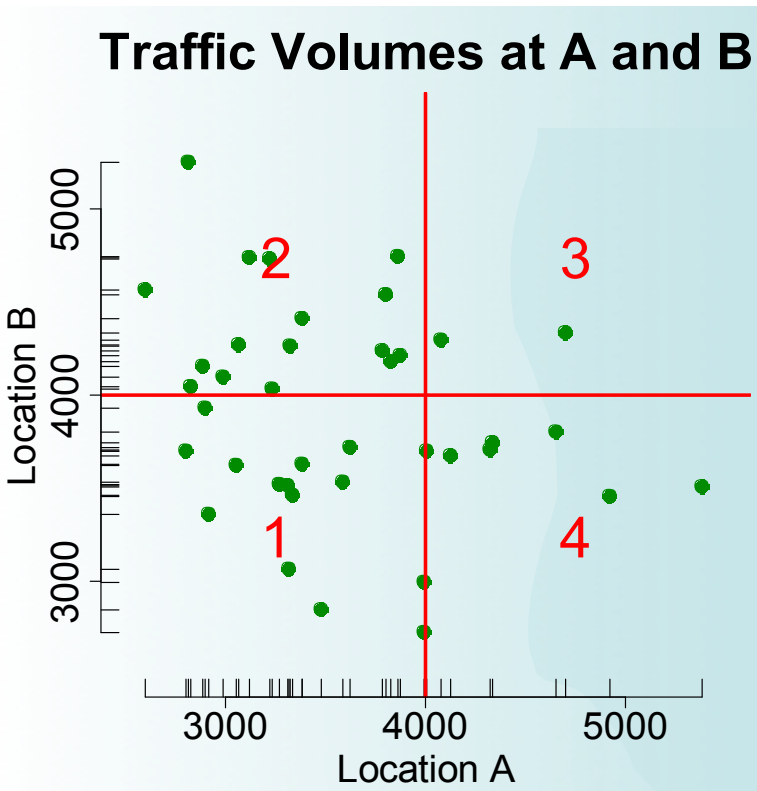
RVMPO Regional Problem Solving (RPS) Study: planning for conditions when population doubles, account for unclear future land-use

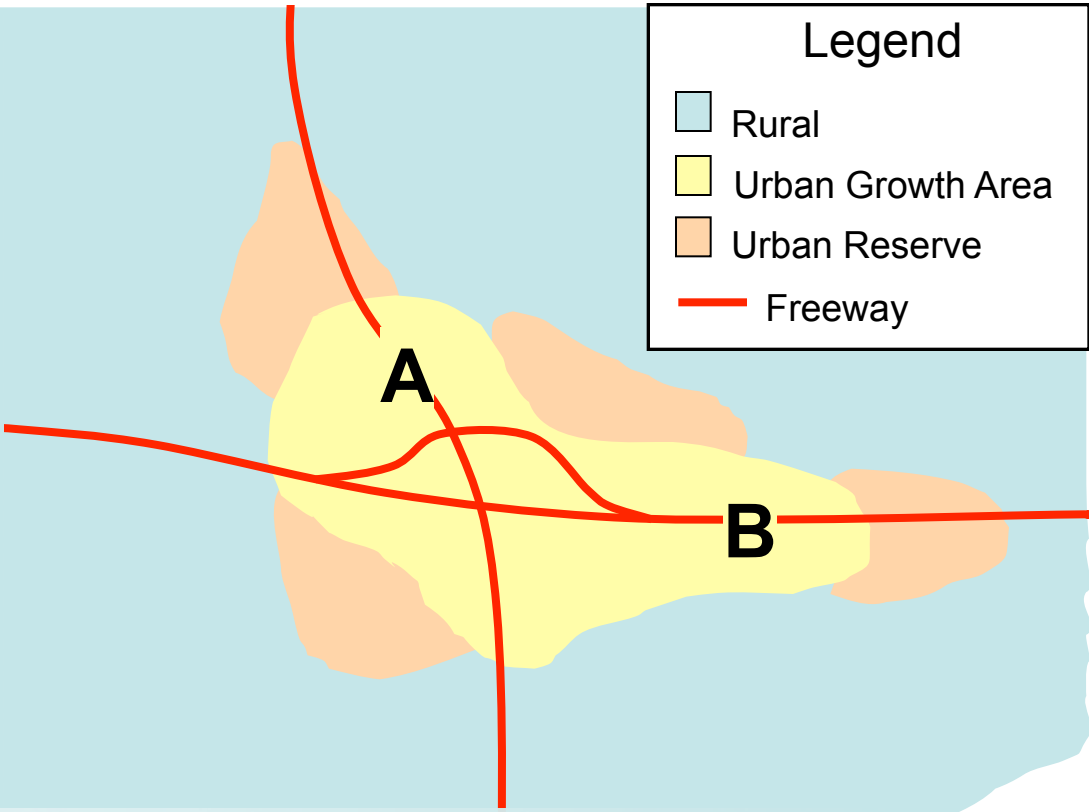
RV MPO Regional Planning Study (RPS)

Employment Growth Tendencies
Related to Enhanced Network Freeway Ramp Congestion



Uncertainty Is Informative





- B is more likely than A to need widening.
- What are the characteristics of scenarios requiring widening, and not requiring widening?

GHG Strategic Transportation Energy Planning (GreenSTEP)

Features: Strategic – State/urban;

Simulates individual household decisions

Identifies Mix of Solutions to reach goals:

demographics, density, mixed use
TDM, car sharing, e-bikes, transit & roads
VMT tax, parking costs, new vehicle/fuels,
Air Quality, social costs, water use, health

Examples:

- **Statewide** Transportation Strategy (STS)
- **Urban:** Metro & CLMPO Scenario Planning

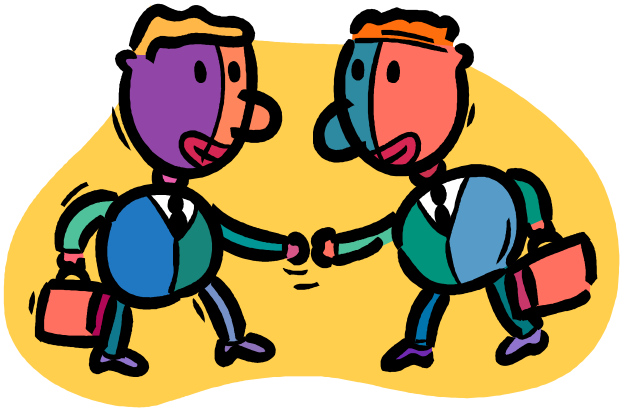
…future Strategic Assessments

Our work continues…

- Travel Cost Index (TCI)
- Bike level of traffic stress
- Transit service connectivity
- Land-use density
- Performance measures
  - Reliability, Safety, MAP21
- New Data: cell phone, Bluetooth, Freight GPS
- "Future Changes" prioritization

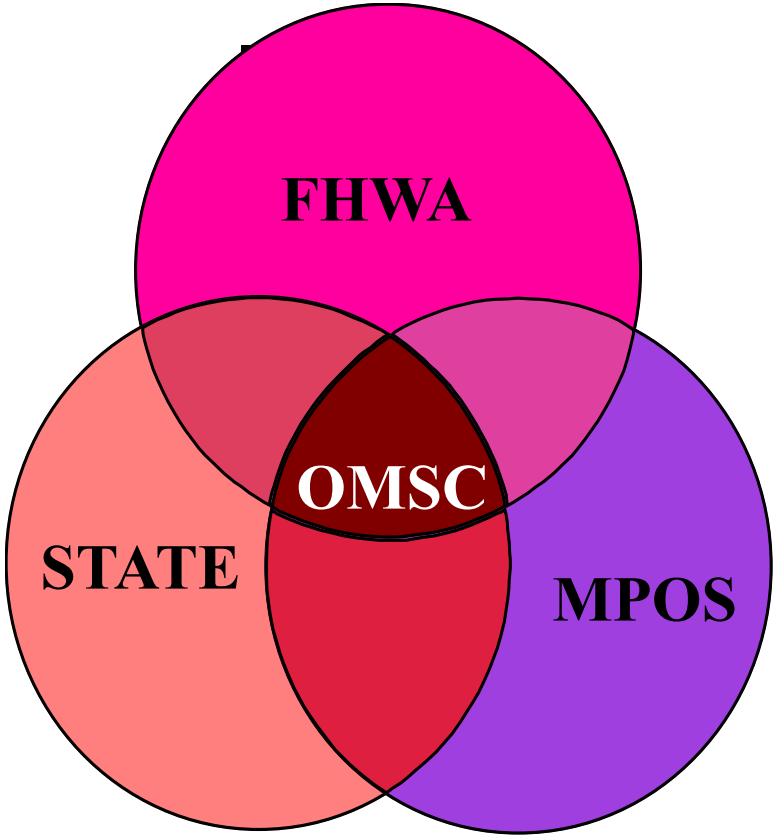
Staying Connected

Last, I want to make you aware of some ways to stay connected while you are finishing up your degrees and after you start your career.



OREGON MODELING STEERING COMMITTEE

Partnership among federal, state and local agencies and jurisdictions



Transportation
Office of Economic Analysis (DAS)
Land Use and Conservation
Environmental Quality
Energy
OTREC

Metro (POP)
MWVCOG
LCOG
RVCOG
Bend
Corvallis

Oregon Modeling User Group

- A group of agencies, consultants, and universities to share Modeling experience and examples
- Meets quarterly
- Kyle Hauger, Metro
  - Kyle.hauger@oregonmetro.gov

Other Communities to link up with

- TMIP
  - http://www.fhwa.dot.gov/planning/tmip/
  - List serve - http://www.fhwa.dot.gov/planning/tmip/community/list_serv.cfm
- Google Plus Community
  - Transportation Data and Modeling
- R Blogs
  - http://www.r-bloggers.com/
  - Google Plus Community – "Statistics and R"
- Python User Groups
  - http://www.pycon.org/
  - Google Plus Community – "Python"
- PSU Friday Seminars
  - http://www.cts.pdx.edu/seminars/

Questions? Ask us!